

IN THE CLAIMS

Please cancel Claims 13, 14, 45 and 46, without prejudice or disclaimer of subject matter.

Please amend Claims 1, 2, 8, 11, 12, 15, 17, 18, 21-27, 31-34, 40, 43, 44, 47, 49, 50, 53-59, 64 and 67-69 to read as follows.

1. (Currently Amended) An apparatus for determining a quality measure indicative of the quality of ~~an audio~~ a speech signal, the apparatus comprising:

a receiver operable to receive a set of speech signal values representative of a speech signal generated by a speech source as distorted by a transmission channel between the speech source and the receiver;

a memory operable to store a predetermined function which includes a first part having first parameters which models said source and a second part having second parameters which models said channel and which gives, for a given set of ~~audio~~ speech signal values, a probability density for parameters of a predetermined ~~audio~~ speech model which is assumed to have generated the set of ~~audio~~ speech signal values, the probability density defining, for a given set of model parameter values, the probability that the predetermined ~~audio~~ speech model has those parameter values, given that the model is assumed to have generated the set of ~~audio~~ speech signal values;

a receiver operable to receive a set of audio signal values representative of an input audio signal;

an applicator operable to apply the set of received ~~audio speech~~ signal values to said stored function to give the probability density for said model parameters for the set of received ~~audio speech~~ signal values;

a processor operable to process said function with said set of received ~~audio speech~~ signal values applied, to derive samples of ~~parameter values at least said first parameters~~ from said probability density; and

an analyser operable to analyse at least some of said derived samples of ~~parameter values said at least first parameters~~ to determine a quality measure indicative of the quality of the received ~~audio speech~~ signal values; and

an output operable to output values of said first parameters that are representative of said speech signal generated by said speech source before it was distorted by said transmission channel.

2. (Currently Amended) An apparatus according to claim 1, wherein said analyser is operable to determine a measure of the variance of said at least some of said derived samples of parameter values said at least first parameters to determine said quality measure.

3. (Previously Presented) An apparatus according to claim 2, wherein said probability density function is in terms of said variance measure and wherein said processor is operable to draw samples of said variance measure from said probability density function.

4. (Previously Presented) An apparatus according to claim 1, wherein said processor is operable to draw samples iteratively from said probability density function.

5. (Previously Presented) An apparatus according to claim 3, wherein said processor comprises a Gibbs sampler.

6. (Previously Presented) An apparatus according to claim 3, wherein said analyser is operable to determine a histogram of said drawn samples and wherein said quality measure is determined using said histogram.

7. (Previously Presented) An apparatus according to claim 6, wherein said analyser is operable to determine said quality measure using a weighted sum of said drawn samples, and wherein the weighting for each sample is determined from said histogram.

8. (Currently Amended) An apparatus according to claim 1, wherein said receiver is operable to receive a sequence of sets of speech signal values representative of an input audio speech signal and wherein said applicator, processor and analyser are operable to perform their respective functions with respect to each set of received audio speech signal values to determine a quality measure for each set of received signal values.

9. (Previously Presented) An apparatus according to claim 8, wherein said processor is operable to use the values of parameters obtained during the processing of a

preceding set of signal values as initial estimates for the values of the corresponding parameters for a current set of signal values being processed.

10. (Original) An apparatus according to claim 8, wherein said sets of signal values in said sequence are non-overlapping.

11. (Currently Amended) An apparatus according to claim 1, wherein said audio speech model comprises an auto-regressive process model and wherein said parameters include auto-regressive model coefficients.

12. (Currently Amended) An apparatus according to claim 1, wherein said audio speech signal model includes a noise model having a noise parameter and wherein said quality measure is determined using said noise parameter.

Claims 13 and 14 (Cancelled).

15. (Currently Amended) An apparatus according to ~~claim 14~~ claim 1, wherein said processor is operable to determine a histogram of said derived samples and wherein said values of said first parameters are determined from said histogram.

16. (Previously Presented) An apparatus according to claim 15, wherein said processor is operable to determine said values of said first parameters using a weighted sum of

said derived samples, and wherein the weighting for each sample is determined from said histogram.

17. (Currently Amended) An apparatus according to ~~claim 14~~ claim 1, wherein said processor is operable to derive samples of said second parameters and wherein said analyser is operable to determine said quality measure using the derived samples of said second parameters.

18. (Currently Amended) An apparatus according to ~~claim 14~~ claim 1, wherein said function is in terms of a set of raw speech signal values representative of speech generated by said source before being distorted by said transmission channel, wherein the apparatus further comprises a second processor operable to process the received set of signal values with initial estimates of said first and second parameters, to generate an estimate of the raw speech signal values corresponding to the received set of signal values and wherein said applicator is operable to apply said estimated set of raw speech signal values to said function in addition to said set of received signal values.

19. (Previously Presented) An apparatus according to claim 18, wherein said second processor comprises a simulation smoother.

20. (Previously Presented) An apparatus according to claim 18, wherein said second processor comprises a Kalman filter.

21. (Currently Amended) An apparatus according to ~~claim 14~~ claim 1, wherein said second part is a moving average model and said second parameters comprise moving average model coefficients.

22. (Currently Amended) An apparatus according to claim 1, further comprising a comparator responsive to said quality measure and operable to compare signals representative of the ~~input audio~~ received speech signal with prestored models, to generate a comparison result.

23. (Currently Amended) An apparatus according to claim 22, wherein said signals representative of the ~~audio~~ speech signal are derived from said stored function.

24. (Currently Amended) An apparatus according to claim 1, further comprising an encoder operable to encode signals representative of the ~~input audio~~ speech signal in dependence upon the output quality measure.

25. (Currently Amended) An apparatus for generating annotation data for use in annotating a data file, the apparatus comprising:

a receiver operable to receive ~~an~~ audio a speech annotation;
an apparatus according to claim 1 for generating a quality measure indicative of the quality of the received ~~audio signal~~ speech annotation; and

a generator operable to generate annotation data using data representative of the received ~~audio signal~~ speech annotation and said quality measure.

26. (Currently Amended) An apparatus according to claim 25, wherein said audio annotation comprises speech data and wherein the apparatus further comprises comprising a speech recogniser operable to process the speech annotation data to identify words and/or phonemes within the speech data; and annotation, wherein said annotation data comprises data identifying said words and/or phonemes.

27. (Currently Amended) An apparatus according to claim 26, wherein said data representative of the input received speech annotation is derived using said apparatus according to claim 1.

28. (Original) An apparatus according to claim 27, wherein said annotation data defines a phoneme and word lattice.

29. (Previously Presented) An apparatus for searching a database comprising a plurality of annotations which include annotation data and a quality measure indicative of the quality of an annotation used to generate the annotation data, the apparatus comprising:
means for receiving an input audio query;
means for determining a quality measure for the input audio query; and

means for comparing data representative of said input query with the annotation data of one or more of said annotations in dependence upon the quality measure for said input query and the corresponding quality measure for the annotation.

30. (Previously Presented) An apparatus according to claim 29, wherein said data representative of said input query and said annotation data comprise word and/or phoneme data.

31. (Currently Amended) An apparatus according to claim 29, wherein said second comparing means is operable to compare said query data with said annotation data using a first comparison technique if both said quality measures exceed a predetermined threshold and is operable to compare said query data with said annotation data using a second comparison technique if either or both of said quality measures are below said predetermined threshold.

32. (Currently Amended) An apparatus for searching a database comprising a plurality of information entries to identify information to be retrieved therefrom, each of said plurality of information entries having an associated annotation and a quality measure indicative of the quality of the annotation;

a receiver operable to receive an input audio speech query;
an apparatus according to claim 1 for processing said input audio speech query to generate a quality measure therefor; and

a comparator operable to compare data representative of the input ~~audio speech~~
query with said annotations in dependence upon the quality measure of said input ~~speech~~ query
and the corresponding quality measures of said annotations.

33. (Currently Amended) A method of determining a quality measure
indicative of the quality of ~~an~~ ~~audio~~ ~~a speech~~ signal, the method comprising the steps of:

receiving, at a receiver, a set of speech signal values representative of a speech
signal generated by a speech source as distorted by a transmission channel between the speech
source and the receiver;

storing a predetermined function which includes a first part having first
parameters which models said source and a second part having second parameters which models
said channel and which gives, for a given set of ~~audio speech~~ signal values, a probability density
for parameters of a predetermined ~~audio speech~~ model which is assumed to have generated the
set of ~~audio speech~~ signal values, the probability density defining, for a given set of model
parameter values, the probability that the predetermined ~~audio speech~~ model has those parameter
values, given that the model is assumed to have generated the set of ~~audio speech~~ signal values;

receiving a set of audio signal values representative of an input audio signal at a
receiver;

applying the set of received ~~audio speech~~ signal values to said stored function to
give the probability density for said model parameters for the set of received ~~audio speech~~ signal
values;

processing said function with said set of received ~~audio speech~~ signal values applied, to derive samples of parameter values ~~at least said first parameters~~ from said probability density;

analysing at least some of said derived samples of parameter values ~~said at least first parameters~~ to determine a quality measure ~~indicative of the quality of the received speech signal of the variance of said at least some of said samples of parameter values~~; and
outputting a signal indicative of the quality of the received audio signal values in dependence upon said determined variance measure

~~outputting values of said first parameters that are representative of said speech signal generated by said speech source before it was distorted by said transmission channel.~~

34. (Currently Amended) A method according to claim 33, wherein said analysing step determines a measure of the variance of said at least some of said ~~derived~~ samples of parameter values ~~said at least first parameters~~ in determining said quality measure.

35. (Original) A method according to claim 34, wherein said probability density function is in terms of said variance measure and wherein said processing step draws samples of said variance measure from said probability density function.

36. (Original) A method according to claim 33, wherein said processing step draws samples iteratively from said probability density function.

37. (Original) A method according to claim 35, wherein said processing step uses a Gibbs sampler.

38. (Original) A method according to claim 35, wherein said analysing step determines a histogram of said drawn samples and wherein said quality measure is determined using said histogram.

39. (Original) A method according to claim 38, wherein said analysing step determines said quality measure using a weighted sum of said drawn samples, and wherein the weighting for each sample is determined from said histogram.

40. (Currently Amended) A method according to claim 33, wherein said receiving step receives a sequence of sets of speech signal values representative of an input ~~audio speech~~ signal and wherein said applying step, processing step, and analysing step are performed with respect to each set of received ~~audio speech~~ signal values to determine a quality measure for each set of received signal values.

41. (Original) A method according to claim 40, wherein said processing step uses the values of parameters obtained during the processing of a preceding set of signal values as initial estimates for the values of the corresponding parameters for a current set of signal values being processed.

42. (Original) A method according to claim 40, wherein said sets of signal values in said sequence are non-overlapping.

43. (Currently Amended) A method according to claim 33, wherein said ~~audio speech~~ model comprises an auto-regressive process model and wherein said parameters include auto-regressive model coefficients.

44. (Currently Amended) A method according to ~~claim 31~~ claim 33, wherein said ~~audio speech~~ signal model includes a noise model having a noise parameter and wherein said quality measure is determined using said noise parameter.

Claims 45 and 46 (Cancelled).

47. (Currently Amended) A method according to ~~claim 46~~ claim 33, wherein said processing step determines a histogram of said derived samples and wherein said values of said first parameters are determined from said histogram.

48. (Original) A method according to claim 47, wherein said processing step determines said values of said first parameters using a weighted sum of said derived samples, and wherein the weighting for each sample is determined from said histogram.

49. (Currently Amended) A method according to ~~claim 46~~ claim 33, wherein said processing step derives samples of said second parameters and wherein said analysing step determines said quality measure using the derived samples of said second parameters.

50. (Currently Amended) A method according to ~~claim 46~~ claim 33, wherein said function is in terms of a set of raw speech signal values representative of speech generated by said source before being distorted by said transmission channel, wherein the method further comprises a second processing step of processing the received set of signal values with initial estimates of said first and second parameters, to generate an estimate of the raw speech signal values corresponding to the received set of signal values and wherein said applying step applies said estimated set of raw speech signal values to said function in addition to said set of received signal values.

51. (Original) A method according to claim 50, wherein said second processing step uses a simulation smoother.

52. (Original) A method according to claim 50, wherein said second processing step uses a Kalman filter.

53. (Currently Amended) A method according to ~~claim 46~~ claim 33, wherein said second part is a moving average model and said second parameters comprise moving average model coefficients.

54. (Currently Amended) A method according to claim 33, further comprising
~~the a~~ step of comparing signals representative of the ~~input audio~~ received speech signal with
prestored models to generate a comparison result and wherein said comparing step is responsive
to said quality measure.

55. (Currently Amended) A method according to claim 54, wherein said
signals representative of the ~~audio speech~~ signal are derived from said stored function.

56. (Currently Amended) A method according to claim 33, further comprising
~~the a~~ step of encoding signals representative of the ~~input audio~~ speech signal in dependence upon
the output quality measure.

57. (Currently Amended) A method of generating annotation data for use in
annotating a data file, the method comprising the steps of:

receiving ~~an~~ audio a speech annotation;
performing the method according to claim 33 ~~for generating~~ to generate a quality
measure indicative of the quality of the received ~~audio signal~~ speech annotation; and
generating annotation data using data representative of the received ~~audio signal~~
speech annotation and said quality measure.

58. (Currently Amended) A method according to claim 57, wherein said
~~audio annotation comprises speech data and wherein the method further comprises comprising~~

the a step of using a speech recognition unit to process the speech data annotation to identify words and/or phonemes within the speech data, and annotation, wherein said annotation data comprises said words and/or phonemes.

59. (Currently Amended) A method according to claim 58, wherein said data representative of the input received speech annotation is derived using said method according to claim 33.

60. (Original) A method according to claim 59, wherein said annotation data defines a phoneme and word lattice.

61. (Previously Presented) A method of searching a database comprising a plurality of annotations which include annotation data and a quality measure indicative of the quality of an annotation used to generate the annotation data, the method comprising the steps of:
receiving an input audio query;
determining a quality measure for the input audio query; and
comparing data representative of said input query with the annotation data of one or more of said annotations in dependence upon the quality measure for said input query and the corresponding quality measure for the annotation.

62. (Previously Presented) A method according to claim 61, wherein said data representative of said input query and said annotation data comprise word and/or phoneme data.

63. (Original) A method according to claim 61, wherein said comparing step compares said query data with said annotation data using a first comparison technique if both said quality measures exceed a predetermined threshold and compares said query data with said annotation data using a second comparison technique if either or both of said quality measures are below said predetermined threshold.

64. (Currently Amended) A method of searching a database comprising a plurality of information entries to identify information to be retrieved therefrom, each of said plurality of information entries having an associated annotation and a quality measure indicative of the quality of the annotation, the method comprising the steps of:

receiving an input audio speech query;

using the method according to claim 33 to process said input audio speech query to generate a quality measure therefor; and

comparing data representative of the input audio speech query with said annotations in dependence upon the quality measure of said input speech query and the corresponding quality measures of said annotations.

65. (Previously Presented) A computer readable medium storing computer executable process steps to cause a programmable computer apparatus to perform the method according to claim 33.

66. (Original) Processor implementable process steps for causing a programmable computing device to perform the method according to claim 33.

67. (Currently Amended) An apparatus for determining a quality measure indicative of the quality of ~~an audio~~ a speech signal, the apparatus comprising:
means for receiving a set of speech signal values representative of a speech signal generated by a speech source as distorted by a transmission channel between the speech source and the receiving means;

a memory for storing a predetermined function which includes a first part having first parameters which models said source and a second part having second parameters which models said channel and which gives, for a given set of ~~audio~~ speech signal values, a probability density for parameters of a predetermined ~~audio~~ speech model which is assumed to have generated the set of ~~audio~~ speech signal values, the probability density defining, for a given set of model parameter values, the probability that the predetermined ~~audio~~ speech model has those parameter values, given that the model is assumed to have generated the set of ~~audio~~ speech signal values;

means for receiving a set of audio signal values representative of an input ~~audio~~ signal;

means for applying the set of received ~~audio~~ speech signal values to said stored function to give the probability density for said model parameters for the set of received ~~audio~~ speech signal values;

means for processing said function with said set of received audio speech signal values applied, to derive samples of parameter values at least said first parameters from said probability density; and

means for analysing at least some of said derived samples of parameter values said at least first parameters to determine a quality measure indicative of the quality of the received audio speech signal values; and

means for outputting values of said first parameters that are representative of said speech signal generated by said speech source before it was distorted by said transmission channel.

68. (Currently Amended) An apparatus for generating annotation data for use in annotating a data file, the apparatus comprising:

means for receiving an audio a speech annotation;
an apparatus according to claim 67 for generating a quality measure indicative of the quality of the received audio signal speech annotation; and
means for generating annotation data using data representative of the received audio signal speech annotation and said quality measure.

69. (Currently Amended) An apparatus for searching a database comprising a plurality of information entries to identify information to be retrieved therefrom, each of said plurality of information entries having an associated annotation and a quality measure indicative of the quality of the annotation;

means for receiving an input audio speech query;

an apparatus according to claim 67 for processing said input audio speech query to generate a quality measure therefor; and

means for comparing data representative of the input audio speech query with said annotations in dependence upon the quality measure of said input speech query and the corresponding quality measures of said annotations.